$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the ith sample; or,

(B) The lower 97½ percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{.975}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of

samples; and $t_{0.975}$ is the t statistic for a 97.5% one-tailed confidence interval with

n-1 degrees of freedom (from Appendix A).

(b) *Certification reports.* (1) The requirements of §429.12 are applicable to room air conditioners; and

(2) Pursuant to §429.12(b)(13), a certification report shall include the following public product-specific information: The energy efficiency ratio (EER in British thermal units per Watt-hour (Btu/W-h)), cooling capacity in British thermal units per hour (Btu/h), and the electrical power input in watts (W).

[76 FR 12451, Mar. 7, 2011; 76 FR 24763, May 2, 2011]

§429.16 **Central air conditioners and heat pumps.**

(a) *Sampling plan for selection of units for testing.* (1) The general requirements of §429.11 are applicable to central air conditioners and heat pumps; and

(2)(i) For central air conditioners and heat pumps, each single-package system and each condensing unit (outdoor unit) of a split-system, when combined with a selected evaporator coil (indoor unit) or a set of selected indoor units, must have a sample of sufficient size tested in accordance with the applicable provisions of this subpart. The represented values for any model of a single-package system, any model of a tested split-system combination, any model of a tested mini-split system combination, or any model of a tested multi-split system combination must be assigned such that—

(A) Any represented value of annual operating cost, energy consumption or other measure of energy consumption of the central air conditioner or heat pump for which consumers would favor lower values shall be greater than or equal to the higher of:

(*1*) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the ith sample; Or,

(*2*) The upper 90 percent confidence limit (UCL) of the true mean divided by 1.05, where:

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$$UCL = \bar{x} + t_{.90}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of

samples; and $t_{0.90}$ is the t statistic for a 90% one-tailed confidence interval with n-

1 degrees of freedom (from Appendix A).

and

(B) Any represented value of the energy efficiency or other measure of energy consumption of the central air conditioner or heat pump for which consumers would favor higher values shall be less than or equal to the lower of:

(1) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the ith sample;

Or,

(2) The lower 90 percent confidence limit (LCL) of the true mean divided by 0.95, where:

$$LCL = \bar{x} - t_{.90}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of

samples; and $t_{0.90}$ is the t statistic for a 90% one-tailed confidence interval with n-

1 degrees of freedom (from Appendix A).

(C) For heat pumps, all units of the sample population must be tested in both the cooling and heating modes and the results used for determining the heat pump's certified Seasonal Energy Efficiency Ratio (SEER) and Heating Seasonal Performance Factor (HSPF) ratings in accordance with paragraph (a)(2)(i)(B) of this section.

(ii) For split-system air conditioners and heat pumps, the condenser-evaporator coil combination selected for tests pursuant to paragraph (a)(2)(i) of this section shall include the evaporator coil that is likely to have the largest volume of retail sales with the particular model of condensing unit. For mini-split condensing units that are designed to always be installed with more than one indoor unit, a "tested combination" as defined in 10 CFR 430.2 shall be used for tests pursuant to paragraph (a)(2)(i) of this section. For multi-split systems, each model of condensing unit shall be tested with two different sets of indoor units. For one set, a "tested combination" composed entirely of non-ducted

indoor units shall be used. For the second set, a ''tested combination'' composed entirely of ducted indoor units shall be used. However, for any split-system air conditioner having a single-speed compressor, the condenser-evaporator coil combination selected for tests pursuant to paragraph (a)(2)(i) of this section shall include the indoor *coil-only* unit that is likely to have the largest volume of retail sales with the particular model of outdoor unit. This *coil-only* requirement does not apply to split-system air conditioners that are only sold and installed with *blower-coil* indoor units, specifically mini-splits, multi-splits, and through-the-wall units. This *coil-only* requirement does not apply to any split-system heat pumps. For every other split-system combination that includes the same model of condensing unit but a different model of evaporator coil and for every other mini-split and multi-split system that includes the same model of condensing unit but a different set of evaporator coils, whether the evaporator coil(s) is manufactured by the same manufacturer or by a component manufacturer, either—

(A) A sample of sufficient size, comprised of production units or representing production units, must be tested as complete systems with the resulting ratings for the outdoor unit-indoor unit(s) combination obtained in accordance with paragraphs (a)(2)(i)(A) and (a)(2)(i)(B) of this section; or

(B) The representative values of the measures of energy efficiency must be assigned as follows:

(*1*) Using an alternative rating method (ARM) that has been approved by DOE in accordance with the provisions of § 429.70(e)(1) and (2); or

(*2*) For multi-split systems composed entirely of non-ducted indoor units, set equal to the system tested in accordance with paragraph (a)(2)(i) of this section whose tested combination was entirely non-ducted indoor units; or

(*3*) For multi-split systems composed entirely of ducted indoor units, set equal to the system tested in accordance with paragraph (a)(2)(i) of this section when the tested combination was entirely ducted indoor units; or

(*4*) For multi-split systems having a mix of non-ducted and ducted indoor

units, set equal to the mean of the values for the two systems—one having the tested combination of all non-ducted units and the second having the tested combination of all ducted indoor units—tested in accordance with paragraph (a)(2)(i) of this section.

(iii) Whenever the representative values of the measures of energy consumption, as determined by the provisions of paragraph (a)(2)(ii)(B) of this section, do not agree within 5 percent of the energy consumption as determined by actual testing, the values determined by actual testing must be used to comply with section 323(c) of the Act or to comply with rules under section 324 of the Act.

(b) *Certification reports.* (1) The requirements of § 429.12 are applicable to central air conditioners and heat pumps; and

(2) Pursuant to § 429.12(b)(13), a certification report shall include the following public product-specific information:

(i) Residential central air conditioners: The seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/W-h)), the cooling capacity in British thermal units per hour (Btu/h), and the manufacturer and individual manufacturer's model numbers of the indoor and outdoor unit. For central air conditioners whose seasonal energy efficiency ratio is based on an installation that includes a particular model of ducted air mover (*e.g.*, furnace, air handler, blower kit), the manufacturer's model number of this ducted air mover must be included among the model numbers listed on the certification report.

(ii) Residential central air conditioning heat pumps: The seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/W-h)), the cooling capacity in British thermal units per hour (Btu/h), the heating seasonal performance factor (HSPF in British thermal units per Watt-hour (Btu/W-h)), and the manufacturer and individual model numbers of the indoor and outdoor unit. For central air conditioning heat pumps whose seasonal energy efficiency ratio and heating seasonal performance factor are based on an installation that includes a particular model of ducted

air mover (*e.g.*, furnace, air handler, blower kit), the model number of this ducted air mover must be included among the model numbers listed on the certification report.

(iii) Small duct, high velocity air conditioners: The seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/W-h)) and the cooling capacity in British thermal units per hour (Btu/h).

(iv) Small duct, high velocity heat pumps: The seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/W-h)), the heating seasonal performance factor (HSPF in British thermal units per Watt-hour (Btu/W-h)), and the cooling capacity in British thermal units per hour (Btu/h).

(iv) Space constrained air conditioners: The seasonal energy efficiency ratio (SEER in British thermal units per Watt-hour (Btu/W-h)) and the cooling capacity in British thermal units per hour (Btu/h).

(v) Space constrained heat pumps: The seasonal energy efficiency ratio (SEER in British thermal units per

Watt-hour (Btu/W-h)), the coefficient of performance, and the cooling capacity in British thermal units per hour (Btu/h).

(c) *Alternative methods for determining efficiency or energy use* for central air conditioners and heat pumps can be found in § 429.70 of this subpart.

[76 FR 12451, Mar. 7, 2011; 76 FR 24763, May 2, 2011]

§ 429.17   Residential water heaters.

(a) *Sampling plan for selection of units for testing.* (1) The requirements of § 429.11 are applicable to residential water heaters; and

(2) For each basic model of residential water heaters, a sample of sufficient size shall be randomly selected and tested to ensure that—

(i) Any represented value of estimated annual operating cost, energy consumption or other measure of energy consumption of a basic model for which consumers would favor lower values shall be greater than or equal to the higher of:

(A) The mean of the sample, where:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

and, $\bar{x}$ is the sample mean; n is the number of samples; and x_i is the ith sample;

Or,

(B) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.10, where:

$$UCL = \bar{x} + t_{.95}\left(\frac{s}{\sqrt{n}}\right)$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of

samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n-

1 degrees of freedom (from Appendix A).

and

(ii) Any represented value of the energy factor or other measure of energy consumption of a basic model for which

consumers would favor higher values shall be less than or equal to the lower of:

(A) The mean of the sample, where: